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RED LIST ASSESSMENTS

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Global and regional IUCN Red List Assessments: 19

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Abstract

In this contribution, the conservation status assessment of three vascular plants according to IUCN categories and criteria are presented. It includes the assessment of *Allium eremoprasum* Vved., *Allium svetlanae* Vved. ex Filim. and *Brassica trichocarpa* C. Brullo, Brullo, Giusso & Ilardi at global level.

Keywords

Conservation, extinction risk, IUCN protocol, threats

How to contribute

The text of the global and regional assessments should be submitted electronically to Simone Orsenigo (simone.orsenigo@unipv.it) or to Giuseppe Fenu (gfenu@unica.it); the text, up to 8000 characters in length (spaces included), must include a distribution map and a picture of the assessed species.

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Red List Assessments

Allium eremoprasum Vved.

Global assessment
Taxonomy and nomenclature
Order: Asparagales *Family*: Amaryllidaceae

Allium eremoprasum Vved., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 92 (1924).

Common name: Desert onion (En); лук пустынный (Rus); cho'l piyozi (Uzb).

Geographic distribution range: *Allium eremoprasum* (Fig. 1) is a bulbous perennial plant 10–25 cm tall. It is a national endemic of Uzbekistan with restricted distribution range and small, severely fragmented populations. This species is distributed in the central part of Uzbekistan, in Nurabad District of Samarkand Region and in Nurata and Khatyrchi Districts of Navoi Region, on the Aktau Range and Zirabulak mountains in the north-western branches of the Pamir-Alay mountain range (Vvedensky 1941, 1971; Khassanov 2016; Tojibaev et al. 2018, 2019; Khassanov et al. 2019). In total, only nine localities are known to date (Fig. 2).

Figure 1. *Allium eremoprasum* Vved. and its habitat on the Aktau Range (Uzbekistan, Navoi Region). Photograph by N. Yu. Beshko.

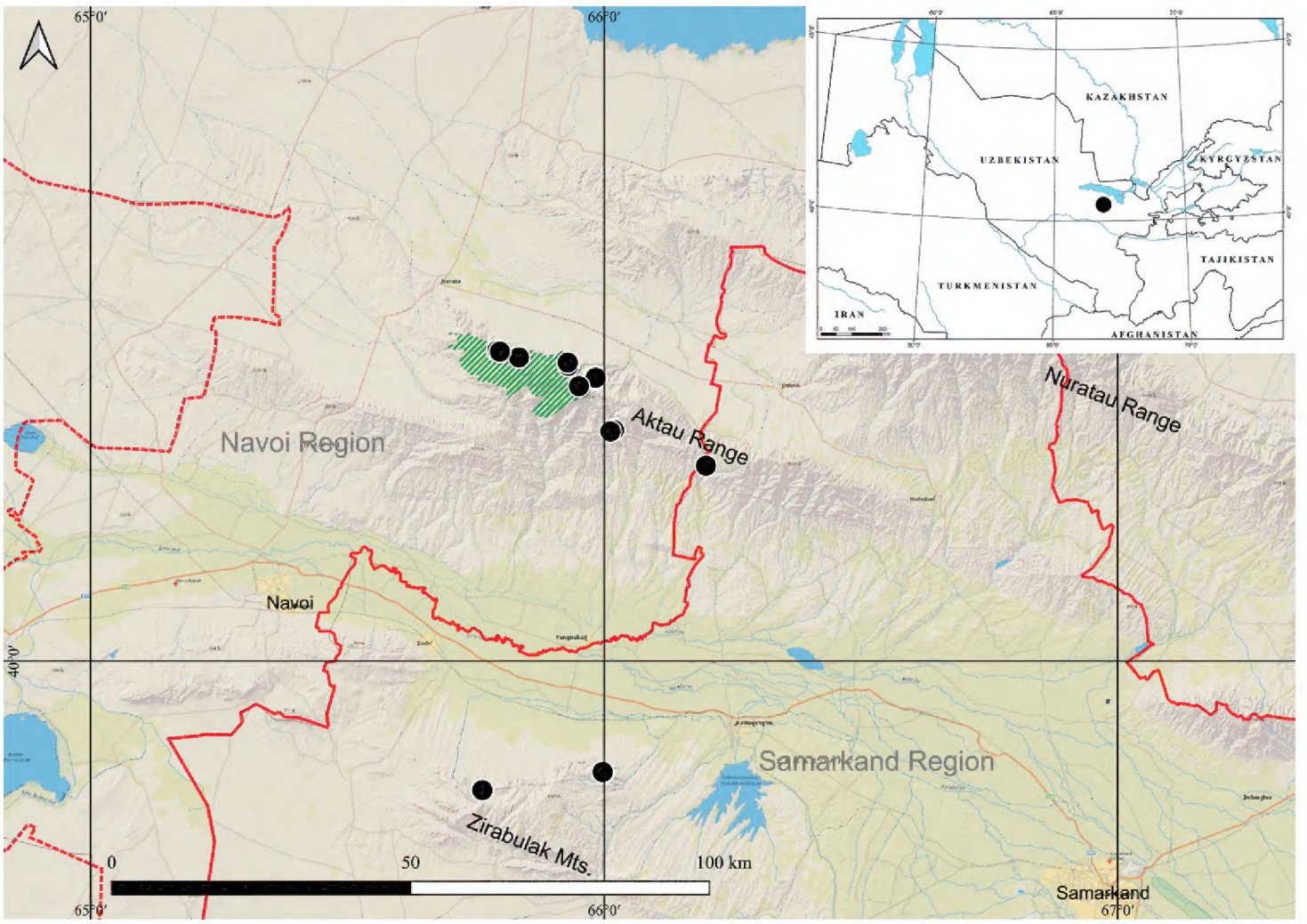

Figure 2. Geographic range and distribution map of *Allium eremoprasum* in Uzbekistan. The protected area of Aktau wildlife sanctuary is shown in green hatch.

Distribution: *Countries of occurrence*: Uzbekistan.

Biology: *Plant growth form*: perennial (geophyte).

Flowering and fruiting time: flowering in May–June, fruiting in June–July (Vvedensky 1941, 1971; Khassanov 2016; Beshko 2020).

Reproduction: Propagation by seeds and bulblets. The reproductive biology of this species has not been studied in detail.

Habitat and ecology: *Allium eremoprasum* is an endemic stenotopic plant that grows on rock ledges and crevices, screes, dry stony slopes, on lithosols and calcic xerosoils, on various types of geological substrates, such as limestones, marbles, granites and schists. This species occurs in lower montane zone, at altitudes from 700 to 1,400–1,600 m a.s.l., in sparse chasmophytic communities (Nowak et al. 2025), together with other threatened subendemic representatives of the genus *Allium* L. (*A. isakulii* R.M.Fritsch & F.O.Khass., *A. praemixtum* Vved.), spiny almond (*Prunus spinosissima* (Bunge) Franch.), grasses (*Bromus tectorum* L., *Stipa hohenackeriana* Trin. & Rupr.), petrophytic perennials and subshrubs (*Andrachne fedtschenkoi* Kossinsky, *Lepidium botschantsevianum* Al-Shehbaz, *Nepeta olgae* Regel, *Scutellaria immaculata* Nevski ex Juz., *Silene guntensis* (B.Fedtsch.) B.Fedtsch. ex Schischk., etc.), annuals (*Callipeltis cucullaris* (L.) DC., *Cerastium inflatum* Gren., *Lamium amplexicaule* L., *Minuartia meyeri* (Boiss.) Bornm.), mosses and lichens.

Population information: *Allium eremoprasum* occurs solitary or in small, isolated groups (3–6 to 20–30 individuals). Two subpopulations of the species are recognized: a smaller one in the Zirabulak Mountains and a larger one in the Aktau Range, separated by the geographical barrier of Zeravshan River valley, largely transformed since ancient times and occupied by irrigated arable lands and settlements, which prevents gene flow between the two subpopulations. The distance between these subpopulations is approximately 50–60 km. This plant inhabits steep rocky slopes, and the mountainous relief renders a significant portion of suitable habitats inaccessible for field surveys; therefore, only approximate estimates of population size can be made. Based on the data of our observations, the overall population of *A. eremoprasum* can be assessed at *c.* 300–500 mature individuals. No data are available on the demographic structure of this species' populations, but habitat extent and quality, number of localities and population size are generally declining due to overgrazing, mining, quarrying, and other anthropogenic pressures. For example, after 1926, not a single occurrence record of this species was known from the Zirabulak Mountains, where it was first described. Thus, most likely the subpopulation on the Zirabulak Mountains is almost collapsed, and an estimated population decline is *c.* 20% in the past 100 years.

Threats:

2.3 Livestock farming & ranching (*2.3.1 Nomadic grazing* and 2.3.2 *Small-holder grazing, ranching or farming*): *Allium eremoprasum* grows on steep rocky slopes inaccessible to livestock, except for goats; overgrazing is a minor direct threat for this species.

3 Energy production & mining (3.2 Mining & quarrying and 3.3 Renewable energy): there are deposits of gold and other minerals, marble, crushed stone and rubble quarries in the Zirabulak Mountains and Aktau Range, intensively developed by the government and private companies. An illegal gold mining by local people also occurs in this region. At the present, geological exploration, mining and quarrying represent the most serious direct threat for *A. eremoprasum*, because of the irreversible transformation of ecosystems, declining and loss of habitats and subpopulations of species. Due to mining and quarrying, a subpopulation on the Zirabulak Mountains (two locations) has nearly collapsed. Furthermore, the construction of a wind power plant is planned in the Zirabulak Mountains, and the large-scale construction works will lead to further declining of quality and extent of habitats, and the extinction of some populations of the species.

10 Geological events (*10.3 Avalanches/landslides*): a significant number of seedlings and young plants are eliminated as a result of mudflows.

CRITERIA APPLIED

Criterion B: **EOO**: 1,857.65 km^2 calculated with a GeoCAT (Geospatial Conservation Assessment Tool) software (Bachman et al. 2011).
AOO: 40 km^2 calculated with GeoCAT software using 2×2 km cells (Bachman et al. 2011).

a) The geographic distribution range is severely fragmented in two subpopulations separated by a geographical barrier.
b) Continuing decline, observed in extent of occurrence (i), area of occupancy (ii), extent and quality of habitat (iii), number of locations or subpopulations (iv) and number of mature individuals (v).

Criterion C: Population size estimated at less than 2,500 mature individuals (the total population size is estimated at *c.* 300–500 mature individuals).

2a(i) Number of mature individuals in largest population is less than 250.

Red List category and Criteria (Global Assessment)

EN	**Endangered**	**EN B1ab(i, ii, iii, iv, v)+2ab(i, ii, iii, iv, v); C2a(i)**

Rationale for the assessment: *Allium eremoprasum* is an endemic stenotopic species with restricted distribution range and with small and severely fragmented population. Although a significant part of this species' population occurs in a protected area, it is affected by human activities such as mining, quarrying and livestock farming and a continuing decline of extent of occurrence, area of occupancy, quality of habitat, number of subpopulations and number of mature individuals is observed. The EOO is less than 5000 km^2 and the AOO is less than 500 km^2. The overall population size is estimated at *c.* 300–500 mature individuals and the number of mature individuals in largest population is less than 250. By applying the criteria B and C, this species meets the thresholds of the Endangered category (EN) at a global level.

Previous assessment: The taxon has never been assessed at global level (IUCN 2025).

Conservation actions: *Allium eremoprasum* is included in the last edition of the Red Data Book of Uzbekistan under category 2 (corresponding to IUCN category EN) (Khassanov et al., 2019). The significant part of the largest subpopulation of this species grows in the Aktau wildlife sanctuary, a protected area of IV category IUCN. This species has only recently been cultivated *ex situ*, and its seeds are not stored in any germplasm bank.

Conservation actions needed: restriction or prohibition of mining and quarrying activities as well as goat grazing within the species' habitat is recommended. Targeted research to improve understanding of the species' reproductive biology, ecology, and population trends are urgent. *Ex situ* cultivation in botanical gardens and seed banking should be encouraged.

Natalya Yu. Beshko, Bekhruz Sh. Khabibullaev, Khabibullo F. Shomurodov, Giuseppe Fenu

Allium svetlanae Vved. ex Filim.

Global assessment
Taxonomy and nomenclature
Order: Asparagales Family: Amaryllidaceae

Allium svetlanae Vved. ex Filim., Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. S.S.R. 20: 40 (1982).

Common name: Svetlana's onion (En); лук Светланы (Rus); Svetlana piyozi (Uzb).

Geographic distribution range: *Allium svetlanae* (Fig. 3) is a bulbous perennial plant 15–40(60) cm tall, usually grows in clusters. It is endemic of Uzbekistan and a narrow endemic to the Nuratau Range in the north-western branches of the Pamir-Alay mountain range (Khassanov 2016; Tojibaev et al. 2018; Beshko 2020; Volis and Beshko 2023). The only known population is confined to the middle reaches of the small river Ustuksay on the southern slope of the Nuratau Range, in Koshrabad District of Samarkand Region, outside of the strictly protected area of the Nuratau State Nature Reserve (Fig. 4).

Distribution: *Countries of occurrence*: Uzbekistan.

Biology: *Plant growth form*: perennial (geophyte).

Flowering and fruiting time: flowering in June–July, fruiting in July–August (Filimonova 1982; Khassanov 2016; Beshko 2020).

Reproduction: Propagation by seeds and bulblets. Reproductive biology of this species has not been studied in detail.

Figure 3. *Allium svetlanae* Vved. ex Filim. from Nuratau Range (Uzbekistan, Samarkand Region). Photograph by N.Yu. Beshko.

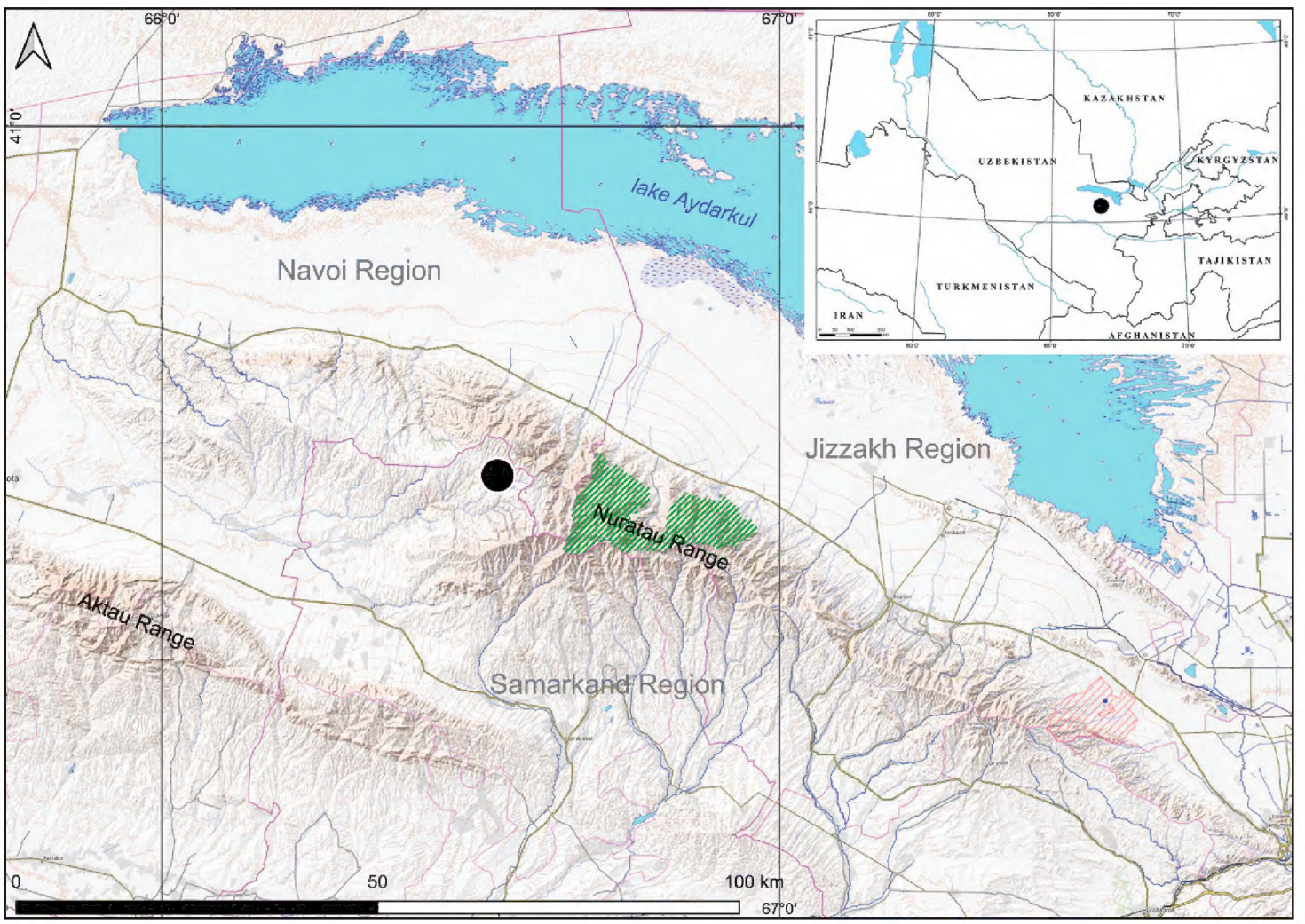

Figure 4. Geographic range and distribution map of *Allium svetlanae* on the Nuratau Range (Uzbekistan).

Habitat and Ecology: *Allium svetlanae* is an endemic plant that is confined to wet habitats and is intolerant of dry conditions. This plant inhabits a narrow rocky gorge with steep slopes, where it grows on damp nutrient-rich alluvial soils along mountain streams, near springs and on wet granite rocks, at altitudes from 1,200 to 1,500 m a.s.l. This species occurs in communities of spring and fen vegetation of the montane belt (Nowak et al. 2025), together with other hydrophilic species (*Calamagrostis pseudophragmites* (Haller f.) Koeler, *Carex diluta* M.Bieb., *Juncus articulatus* L., *Mentha longifolia var. asiatica* (Boriss.) Rech.f., etc.) and sometimes forms dense clumps.

Population information: To date, a single population of *A. svetlanae* is known. The harsh topography makes a significant part of the population inaccessible for research. Therefore, only an approximate estimate of the overall population size can be made. Based on the data of the field studies performed in 2013, population size was estimated at *c.* 5,000–10,000 mature individuals (Beshko 2018; Volis and Beshko 2023). However, the surveys of 2024 and 2025 showed that the population has significantly decreased due to the reduction and degradation of mountain wetlands as a consequence of anthropogenic and climatic factors and currently consists of *c.* 2,500–3,000 plants. Thus, the population has declined of 54% in the number of individuals over the last 10 years. No data on the demographic structure of populations is available.

Threats:

2.3 Livestock farming & ranching (*2.3.1 Nomadic grazing* and 2.3.2 *Small-holder grazing, ranching or farming*): in Uzbekistan, livestock grazing is considered the main threat to rare species (Fenu et al. 2024). For a long time, the mountain pastures of the Nuratau Range are subject to excessive grazing. Although *A. svetlanae* grows in the gorge inaccessible to livestock, overgrazing is a serious indirect threat for this species, because it leads to soil erosion, changes in the hydrological regime, drying up of springs and decreasing in the flow of mountain streams, and, ultimately, to habitat degradation and loss.

3 Energy production & mining (3.2 Mining & quarrying): there are gold deposits in the Nuratau Range, which have been intensively studied and developed by the government and private companies, especially in recent years. Illegal gold mining by local people also occurs in the Ustuksay valley and its surroundings. Gold mining is the most serious direct threat for *A. svetlanae*, because it could lead to the irreversible loss of the entire population of this species.

10 Geological events (*10.3 Avalanches/landslides*): a significant number of seedlings and young plants are eliminated as a result of mudflows.

11 Climate change & severe weather (11.1 Habitat shifting & alteration and 11.2 Droughts): In Uzbekistan, droughts occur regularly (every several years). An analysis of long-term climatic data showed that the process of desertification has increased significantly in last decades. Climate aridization leads to drying up of springs and decreasing in the flow of watercourses, and to reduction and degradation of mountain wetlands. The results of species distribution modeling (SDM) demonstrate that a suitable range of *A. svetlanae* will decrease significantly with further climate aridization (scenario RCP8.5), and the extinction risk of this species will increase (Volis and Beshko 2023). As noted above, between 2013 and 2025, the population has declined by approximately half as a result of the combined effects of climate aridization, mining operations, and drying up of springs and streams due to extensive pasture load.

CRITERIA APPLIED:

Criterion A: the population experienced an observed decline of 54% in the number of individuals over the last 10 years.

Criterion B: **EOO**: 12 km^2 calculated with a GeoCAT (Geospatial Conservation Assessment Tool) software (Bachman et al. 2011).
AOO: 12 km^2 calculated with GeoCAT software using 2×2 km cells (Bachman et al. 2011).

a) Only one location is known.
b) Continuing decline observed in extent and quality of habitat (iii) and number of mature individuals (v).

Red List category and Criteria (Global Assessment)

CR	**Critically Endangered**	**B1ab(iii,v)**

Rationale for the assessment: *Allium svetlanae* is an endemic stenotopic species with restricted distribution range of which a single population is known, estimated at around 2,500–3,000 mature individuals. The only known population is affected by human activities as livestock farming and geological exploration, as well as by climate change and experienced a sharp reduction in the number of mature individuals. EOO and AOO both are 12 km^2. By applying the criterion B, considering that the EOO is less than 100 km^2, that a single population is known and the observed continuing decline in the quality of habitat and number of mature individuals, this species meets quantitative requirements to be assessed as Critically Endangered (CR) at a global level.

Previous assessment: The taxon has never been assessed at the global level (IUCN 2025).

Conservation actions: *Allium svetlanae* has never been included in the Red Data Book of Uzbekistan (1984, 1998, 2006, 2009, 2019). This species is not protected *in situ*, has only recently been cultivated *ex situ*, and its seeds are not conserved in any germplasm bank. Ongoing initiatives, such as the "Digital Nature: Development of a digital platform for the flora and fauna of central Uzbekistan" project, are already being implemented to support research, monitoring, and conservation planning.

Conservation actions needed: Expansion of the borders of the Nuratau Nature Reserve or establishment of a new protected area, as well as prohibition of mining and geological exploration in the only known location of the species are recommended. Moreover, regulation of pasture load would be advisable. Research to better understand the reproductive biology and ecology of the species, monitoring the population trends, and impact of climate change are urgently needed. Cultivation *ex situ* in botanical gardens and seed banking should be encouraged.

Natalya Yu. Beshko, Bekhruz Sh. Khabibullaev, Khabibullo F. Shomurodov, Giuseppe Fenu

Brassica trichocarpa C.Brullo, Brullo, Giusso & Ilardi

Global assessment

Taxonomy and nomenclature

Order: Brassicales *Family*: Brassicaceae

Brassica trichocarpa C.Brullo, Brullo, Giusso & Ilardi, Phytotaxa 122 (1): 45–60 (2013).

Common name: Cavolo del Monte Cuccio (It).

Geographic distribution range: *Brassica trichocarpa* (Fig. 5) was discovered in 2012 growing as an endemic plant species on a calcareous rocky ridge at 950 m a.s.l., near Monte Cuccio, within the municipality of Palermo (Italy) (Brullo et al. 2013; Fig. 6).

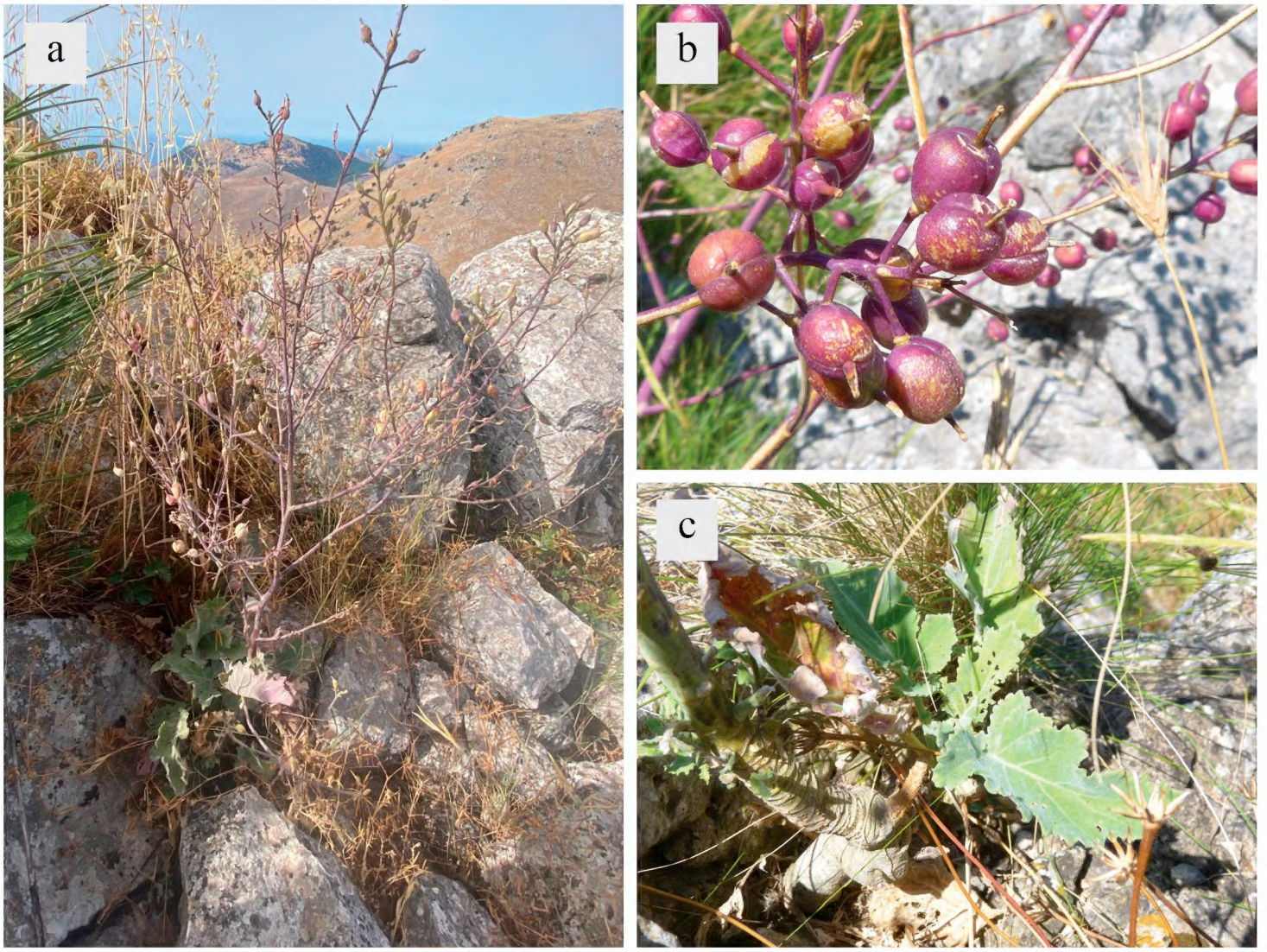

Figure 5. *Brassica trichocarpa* C. Brullo, Brullo, Giusso & Ilardi (Monte Cuccio). Photographs by F. Branca (**a**) and L. Maggioni (**b** and **c**).

Distribution: *Countries of occurrence*: Italy (Sicily).

Biology: *Plant growth form*: perennial (suffruticose chamaephyte).

Chromosome number: So far not verified, but it is assumed to be *2n = 18* (Brullo et al. 2013).

Flowering and fruiting time: flowering from May to early June, fruiting from late June to July.

Reproduction: No specific studies have been carried out so far. It is considered to belong to the *Brassica oleracea* complex (*Brassica* section *Brassica*), which includes insect-pollinated taxa, with a variable level of self-sterility. The most probable dispersal strategy is barochory. Preliminary germination tests, carried out at the University of Catania, indicate that after ten days at a temperature of 25 °C in the dark, 6 out of 10 seeds regularly germinated.

Habitat and ecology: *Brassica trichocarpa* is a biennial or perennial plant species occurring exclusively along a single narrow ridge of calcareous rocks, at around 950 m a.s.l. within the thermo-xeric grassland dominated by *Ampelodesmos mauritanicus* (Poir.) T.Durand & Schinz.

Population information: At the time of discovery, the population was estimated to be *c.* 50 individuals (Brullo et al. 2013). In the last couple of years, field observations recorded a dramatic reduction in the number of individuals. In June 2024, it was

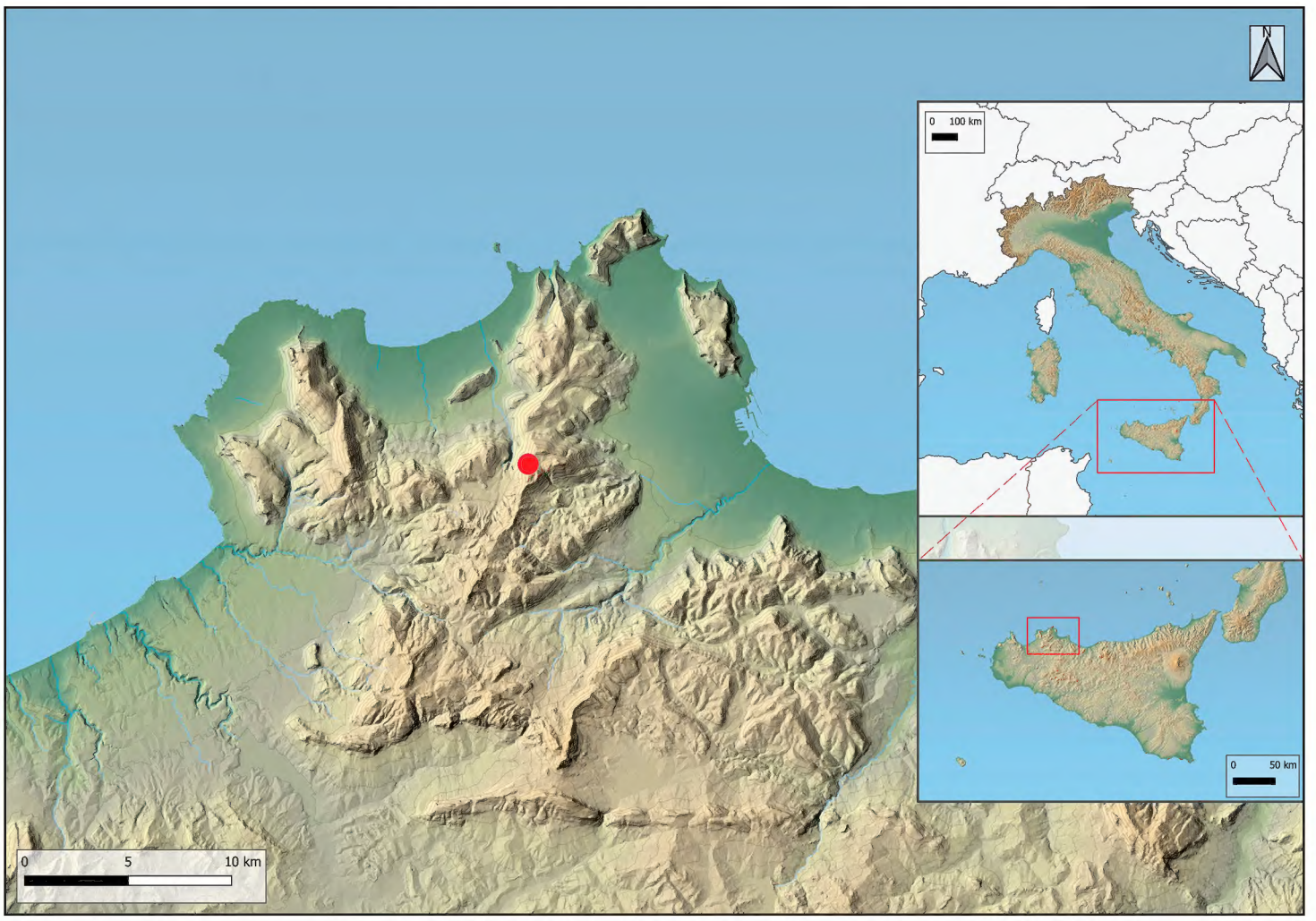

Figure 6. Geographic range and distribution map of *Brassica trichocarpa* C. Brullo, Brullo, Giusso & Ilardi. Map developed by Claudio Ballerini with Natural Earth.

possible to count only one reproductive plant and 4–5 vegetative plants, distributed within a limited area of no more than 2,500 m^2.

Threats:

2.3 Livestock farming and ranching (nomadic grazing): grazing by cows poses a potential threat, as they have been observed reaching the top of the ridges near those where the wild kale grows, owing to poor maintenance of the fences intended to keep the herd at lower altitudes. Even though cattle typically prefer to graze on less steep and rocky terrain, this wild kale is a highly palatable and succulent target attracting herbivores, especially during dry periods. Therefore, chances to extend the population's area of growth are severely limited, and the spots where it currently survives are not sufficiently protected from the danger of roaming cattle.

7.1.1 Increase in fire frequency/intensity: as in many parts of Sicily, fires are increasingly and regularly raised in this area each summer. This criminal practice has likely been the main cause of the reduction of the population. In fact, new seedlings do not have the time to reach their reproductive stage, which requires at least one year.

CRITERIA APPLIED:

Criterion B: **EOO**: 4 km^2 calculated as the area of a polygon drawn in Google Earth Pro.
AOO: 4 km^2 calculated with visual approximation.

a) only one location.
b) Continuing decline observed in: (ii) extent of occurrence, (iii) quality of habitat and (v) number of mature individuals.

Criterion D: only one mature individual in the population.

Red List category and Criteria (Global Assessment)

CR	**Critically Endangered**	**B1ab(ii,iii,v)+B2ab(ii,iii,v) + D**

Rationale for the assessment: this endemic species was discovered in 2012 (Brullo et al. 2013). At the time, the population comprised several individuals, but it was immediately recognized to be critically endangered due to its very narrow distribution range. The status of the population is such that the risk of extinction in the wild is very high, while the reduction in its genetic diversity is inevitable, including the negative effect of reproduction taking place most likely by self-pollination in 2024. There is hope of cross-fertilization starting again in 2025, provided the few remaining vegetative plants survive until next year and reach the reproductive stage. A positive note is that the only visible mature individual was able to set apparently vital seeds in June 2024, indicating either that it is not self-sterile, or that at least a second mature individual exists somewhere in the surroundings. The current assessment, based on the occurrence in a single location, within a very narrow area of less than 1 km^2 and a continuing decline in the EOO and number of mature individuals, confirms the status of Critically Endangered (CR).

Previous assessment: When first described, the species was evaluated as Critically Endangered (CR) (Brullo et al. 2013). It was subsequently classified as Nearly Threatened (NT) (Orsenigo et al. 2018).

Conservation actions: *Brassica trichocarpa* grows within a Natura 2000 protected area, Special Area of Conservation (SAC) "Raffo Rosso, Monte Cuccio e Vallone Sagano" (code ITA020023). Interestingly, as part of the Prioritized Action Framework (PAF) and management plan of Natura 2000, an intervention targeted to "..safeguarding, protection, conservation and improvement of natural/forest area, through increase of stability, habitat functionality and contributing to halting the loss of biodiversity…" was funded by the European Regional Development Fund (ERDF) in this area between October and December 2021 (code G999J21005700006) with €871,000. Unfortunately, no signs of effective management were observed. Moreover, the burned pine forest indicated the occurrence of recent fires, while the old iron fence meant to contain the cattle remains pulled down in several places. *Ex situ* conservation has also not been carried out so far. *Brassica trichocarpa* is not listed in the European Search Catalogue for Plant Genetic Resources (EURISCO 2025) or other publicly available database. To our knowledge, no seeds are being maintained for long-term conservation purposes. In June 2024, a few seeds from the single existing fruiting plant were collected for conservation and research purposes by the University of Catania.

Conservation actions needed: The primary action needed is to multiply the recently collected seeds, aiming to store them in multiple locations for long-term conservation and also potential future re-introduction *in situ*. Effective site management would require rebuilding a proper fence to contain cattle and enacting severe measures to prevent fires. Research should be carried out, with minimum impact on the remaining *in situ* population, to verify the viability of the seeds (germination rate) and to understand the level of self-incompatibility, the genetic diversity status and phylogenetic relatedness with similar species.

Vincenzo Ilardi, Lorenzo Maggioni, Ferdinando Branca

References

Bachman S, Moat J, Hill AW, Torre J de la, Scott B (2011) Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith V, Penev L (Eds) E-Infrastructures for data publishing in biodiversity science. ZooKeys 150: 117–126. https://doi.org/10.3897/zookeys.150.2109 [Version BETA]

Beshko NYu (2018) Endemic plants of the Nuratau mountains (North-Western Pamir-Alay). Uzbek Biological Journal 4: 13–18.

Beshko NYu (2020) Flora of Central Asia: the Nuratau Mountains. Korea National Arboretum, Pocheon, 432 pp.

Brullo C, Brullo S, Giusso del Galdo G, Ilardi V (2013) *Brassica trichocarpa* (Brassicaceae), a new species from Sicily. Phytotaxa 122(1): 45–60. https://doi.org/10.11646/phytotaxa.122.1.2

EURISCO (2025) EURISCO Catalogue. http://eurisco.ecpgr.org [2025-04-01]

Fenu G, Caccianiga M, Khabibullaev BS, Mangili F, Shomurodov KF, Valle B, Orsenigo S (2024) Global and Regional IUCN Red List Assessments: 17. Italian Botanist 18: 141–153. https://doi.org/10.3897/italianbotanist.16.115947

Filimonova ZN (1982) A new species of the genus *Allium* L. from Nuratau. Botanicheskie materialy Gerbariya Instituta Botaniki Akademii Nauk UzSSR 20: 39–41.

Khassanov FO (2016) Family Amaryllidaceae, in Flora of Uzbekistan, 1. Navro'z Publishers, Tashkent, 1–119.

Khassanov FO, Kuchkarov BT, Tojibaev KSh, Pratov UP, Belolipov IV, Shomurodov HF, Beshko NYu (2019) The Red Data Book of The Republic of Uzbekistan. Tasvir, Tashkent, 267 pp.

Nowak A, Nobis M, Nowak S, Kotowski M, Klichowska E, Nobis A, Swierszcz S (2025) Vegetation of Middle Asia with a special reference to Tajikistan. Monographiae Botanicae 111. Polish Botanical Society, Wroclaw, 623 pp. https://doi.org/10.5586/9788396979872

Orsenigo S, Montagnani C, Fenu G, Gargano D, Peruzzi L, Abeli T, Alessandrini A, Bacchetta G, Bartolucci F, Bovio M, Brullo C, Brullo S, Carta A, Castello M, Cogoni D, Conti F, Domina G, Foggi B, Gennai M, Gigante D, Iberite M, Lasen C, Magrini S, Perrino-EV, Prosser F, Santangelo A, Selvaggi A, Stinca A, Vagge I, Villani M, Wagensommer RP,

Wilhalm T, Tartaglini N, Duprè E, Blasi C, Rossi G (2018) Red Listing plants under full national responsibility: Extinction risk and threats in the vascular flora endemic to Italy. Biological Conservation 224: 213–222. https://doi.org/10.1016/j.biocon.2018.05.030

Tojibaev KSh, Beshko NYu, Kodyrov UKh, Batoshov AR, Mirzalieva DU (2018) Inventory of the flora of Uzbekistan: Samarkand Province. Fan Publishers, Tashkent, 220 pp. [In Russian]

Tojibaev KSh, Beshko NYu, Shomurodov KhF, Abduraimov OS, Adilov BA, Akhmedov AK, Rakhimova TT, Rakhimova NK, Saribaeva ShU, Khayitov RSh, Sharipova VK (2019) Inventory of the flora of Uzbekistan: Navoi Province. Fan Publishers, Tashkent, 216 pp. [In Russian]

Volis S, Beshko N (2023) How to preserve narrow endemics in view of climate change? The Nuratau Mountains as the case. Plant Diversity of Central Asia 2(2): 82–101. https://doi.org/10.54981/PDCA/vol2_iss2/a3

Vvedensky AI (1924) Decas Alliorum novorum ex Asia Media. Botanicheskie materialy Gerbariya Glavnogo Botanicheskogo Sada R.S.F.S.R. 5: 89–96.

Vvedensky AI (1941) Genus *Allium* L., in Flora of Uzbekistan, 1. Uzbekistanian branch of the Academy of Sciences of the USSR, Tashkent, 427–467. [In Russian]

Vvedensky AI (1971) Genus *Allium* L., in Conspectus Florae Asiae Mediae, 2. Fan Publishers, Tashkent, 39–89. [In Russian]